

CLAIMS:

1 ~~Sub~~ A post-processing method for correcting media noise errors and  
2 producing a corrected recovered data output signal, for use in a  
3 sampled data read channel of a mass data storage device that has  
4 a Viterbi detector that receives actual sampled partial response  
5 target data from a data medium of the mass data storage device,  
6 comprising:

7 filtering a recovered partial response target signal derived  
8 from said recovered data output signal and said sampled partial  
9 response target data to produce a filtered output signal;

10 providing a threshold circuit to provide a threshold against  
11 which said filtered output signal is compared;

12 adding a predetermined value to the filtered output signal  
13 when a predetermined error event pattern due to media noise  
14 occurs in said recovered data output signal;

15 and modifying the recovered data output signal when said  
16 filtered output signal exceeds the threshold of said threshold  
17 circuit.

1 2. The method of claim 1 wherein said Viterbi detector is an EEPR4  
2 Viterbi detector.

1 3. The method of claim 1 wherein said Viterbi detector is an  
2 EEPR4 Viterbi detector.

1 4. The method of claim 1 wherein said error event pattern is  $ex =$   
2  $\pm\{1\}$ .

1 5. The method of claim 1 wherein said error event pattern is  $ex =$   
2  $\pm\{1-1\}$ .

1 6. The method of claim 1 wherein said filtering is accomplished  
2 by applying said output to an FIR filter.

1 ~~Sub 1~~ The method of claim 1 wherein said predetermined value in an  
2 ~~EPR4~~ channel is  $-A$  when said predetermined error event pattern is  
3 "1X1".

1 8. The method of claim 1 wherein said predetermined value in an  
2 EPR4 channel is  $+A$  when said predetermined error event pattern is  
3 "0X0".

1 9. The method of claim 1 wherein said predetermined value in an  
2 EPR4 channel is 0 when said predetermined error event pattern is  
3 other than "1X1" or "0X0".

1 10. The method of claim 1 wherein said predetermined value in an  
2 EEPR4 channel is determined from the following tables:

Recovered Write Current $\hat{c}(k)$								Output
k	-3	-2	-1	0	1	2	3	
	X	0	0	X	0	0	X	Ajitter
	1	1	0	X	0	0	X	
	X	0	0	X	0	1	1	
	X	1	1	X	1	1	X	-Ajitter
	0	0	1	X	1	1	X	
	X	1	1	X	1	0	0	
Others								0

Polarity Check				Correction	
Amplitude	Polarity	$\hat{c}(0)$	$\hat{c}(1)$	$\hat{c}(0)$	$\hat{c}(1)$
$ fexA(6)  > V_{thA}$	$FexA(6) > 0$	0	X	1	X
	$FexA(6) < 0$	1	X	0	X
$ FexB(6)  > V_{thA}$	$FexA(6) > 0$	0	1	1	0
	$FexA(6) < 0$	1	0	0	1

4 wherein the polarity check correction table is logically  
5 or'd with the output of the recovered write current  $\hat{c}(k)$  table to  
6 produce a correction value.

1 11. The method of claim 1 wherein said predetermined value in an  
2 EPR4 channel is determined from the following table:

Recovered Write Current $\hat{c}(k)$				Output
k	-1	0	1	
	0	X	0	Ajitter
	1	X	1	-Ajitter
Others				0

3 and the polarity is determined from the following table:

Polarity check		Correction	
Amplitude	Polarity		
$ fexA  > VthA$	$FexA > 0$	0	1
	$FexA < 0$	1	0

1 12. A sampled data detection technique for use in a mass data  
2 storage device for correcting for media noise, comprising:

3 detecting an actual sampled partial response target from a  
4 transducer head of said mass data storage device which has been  
5 equalized to a partial response level of at least EPR4 in a  
6 Viterbi detector having a partial response detection level of at  
7 least EPR4 to produce a recovered data output signal;

8 delaying said actual sampled partial response target signal  
9 for a time substantially equal to a time required by said Viterbi  
10 detector to generate said recovered data output signal from said  
11 actual sampled partial response target signal to produce a  
12 delayed actual sampled partial response target signal;

13 converting said recovered data output signal to a partial  
14 response level of said actual sampled data output signal to  
15 produce a converted recovered partial response target signal;  
16 subtracting said converted recovered partial response target  
17 signal from said delayed actual sampled partial response target  
18 signal to produce an error signal;  
19 determining the occurrence of a predetermined error event  
20 pattern in said recovered data output signal to produce a  
21 filtered output signal;  
22 adding a predetermined value to the filtered output signal  
23 when a predetermined error event pattern due to media noise  
24 occurs in said recovered data output signal;  
25 and modifying the recovered data output signal when said  
26 filtered output signal exceeds the threshold of said threshold  
27 circuit.

1 13. The method of claim 12 wherein said producing a detection  
2 signal comprises filtering said error signal with an FIR filter.

1 14. The method of claim 12 wherein said determining the  
2 occurrence of a predetermined error event pattern in said  
3 recovered data output signal comprises determining the occurrence  
4 of  $ex = \pm\{1\}$  in said recovered data output signal.

1 15. The method of claim 12 wherein said determining the  
2 occurrence of a predetermined error event pattern in said  
3 recovered data output signal comprises determining the occurrence  
4 of  $ex = \pm\{1-1\}$  in said recovered data output signal.

1 ~~16. The method of claim 12 wherein said predetermined value in an~~  
2 ~~EEPR4 channel is determined from the following tables:~~

Recovered Write Current $\hat{c}(k)$								Output
k	-3	-2	-1	0	1	2	3	
	X	0	0	X	0	0	X	Ajitter
	1	1	0	X	0	0	X	
	X	0	0	X	0	1	1	
	X	1	1	X	1	1	X	-Ajitter
	0	0	1	X	1	1	X	
	X	1	1	X	1	0	0	
Others								0

Polarity Check				Correction	
Amplitude	Polarity	$\hat{c}(0)$	$\hat{c}(1)$	$\hat{c}(0)$	$\hat{c}(1)$
$ fexA(6)  > V_{thA}$	$FexA(6) > 0$	0	X	1	X
	$FexA(6) < 0$	1	X	0	X
$ FexB(6)  > V_{thA}$	$FexA(6) > 0$	0	1	1	0
	$FexA(6) < 0$	1	0	0	1

wherein the polarity check correction table is logically or'd with the output of the recovered write current  $\hat{c}(k)$  table to produce a correction value.

17. The method of claim 12 wherein said predetermined value in an EPR4 channel is determined from the following table:

Recovered Write Current $\hat{c}(k)$				Output
k	-1	0	1	
	0	X	0	Ajitter
	1	X	1	-Ajitter
Others				0

and the polarity is determined from the following table:

Polarity check		Correction	
Amplitude	Polarity		
$ fexA  > V_{thA}$	$FexA > 0$	0	1
	$FexA < 0$	1	0

1 18. A post-processor circuit for use in a sampled data read  
2 channel of a mass data storage device of the type using a Viterbi  
3 detector that receives an actual sampled partial response target  
4 signal from a storage medium of said mass data storage device to  
5 produce a recovered data output signal, comprising:

6 an error pattern detector to generate an error pattern event  
7 indicating signal if a predetermined error event pattern occurs  
8 in said sampled partial response target signal;

9 a circuit for generating an error signal based upon a  
10 difference between said recovered data output signal and a  
11 delayed said actual sampled partial response target signal;

12 a circuit for adding a predetermined value to the error  
13 signal when a predetermined error event pattern due to media  
14 noise occurs in said recovered data output signal;

15 a threshold circuit to generate an error correction control  
16 signal if a magnitude of said error signal exceeds a  
17 predetermined threshold;

18 and an error correction circuit to modify the recovered data  
19 output signal when said error correction control signal and said  
20 error event pattern indicating occurrence signal are generated.

1 19. The circuit of claim 18 wherein said predetermined error  
2 pattern event is  $ex = \pm\{1\}$ .

1 20. The circuit of claim 18 wherein said predetermined error  
2 pattern event is  $ex = \pm\{1-1\}$ .

1 21. The circuit of claim 18 wherein said circuit for generating  
2 an error signal is an FIR filter

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100
1990	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100

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AO  
Cont. 3

Others	0
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and the polarity is determined from the following table:

Polarity check		Correction	
Amplitude	Polarity		
$ fexA  > VthA$	$FexA > 0$	0	1
	$FexA < 0$	1	0

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6622E0"EE8E/250